

ACCESSION #: 9906140198

NON-PUBLIC?: N

LICENSEE EVENT REPORT (LER)

FACILITY NAME: MONTICELLO NUCLEAR GENERATING PLANT PAGE: 1 OF 5

DOCKET NUMBER: 05000263

TITLE: Manual Scram Inserted When Pressure Transient Closes Air

Ejector Suction Isolation Valves and Trips Off-gas System

EVENT DATE: 05/08/99 LER #: 99-005-00 REPORT DATE: 06/07/99

OTHER FACILITIES INVOLVED: DOCKET NO: 05000

OPERATING MODE: N POWER LEVEL: 100%

THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR SECTION:

50.73(a)(2)(iv)

LICENSEE CONTACT FOR THIS LER:

NAME: Tom Parker TELEPHONE: (612) 295-1014

COMPONENT FAILURE DESCRIPTION:

CAUSE: SYSTEM: COMPONENT: MANUFACTURER:

REPORTABLE NPRDS:

SUPPLEMENTAL REPORT EXPECTED: NO

ABSTRACT:

A rapid recombination of hydrogen and oxygen in the Off-gas system caused a pressure transient that initiated an isolation of valves between the main condenser and the air ejectors. With no means of removing off-gas, operations personnel reduced power and manually scrammed the reactor. Following the reactor scram, low steam line pressure caused a Group 1 containment isolation which closed the main steam isolation valves. Three safety relief valve openings occurred while the main steam isolation valves were

closed. The main steam isolation valves were reopened, and the plant was placed in cold shutdown.

The rapid recombination of hydrogen and oxygen was caused by recombiner catalyst migration. The Group 1 containment isolation was caused by the reactor mode switch being in RUN when the steam line pressure decreased to the Group 1 low pressure set point. All safety systems performed as designed.

Catalyst has been removed from the off-gas piping up to the recombiner. A time delay was added to the high pressure trip for the air ejector suction isolation valves. Training was provided to all licensed operators.

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#### Description

At 1331 on May 8, 1999, with the plant operating at 100% power, annunciators alerted control room operators that the air ejector suction isolation valves1\_ / had closed on high pressure (set point 10 psig) and the "B" Off-gas Recombiner2\_ / had tripped on high pressure (set point 20 psia).

Procedures did not allow the air ejector suction isolation valves to be reopened when reactor power was greater than 5%. At 1339, after reducing reactor power and with no means of removing off-gas from the main condenser, the shift supervisor ordered a manual reactor scram in accordance with the procedure for responding to decreasing condenser vacuum. Six seconds later, reactor water level decreased below the low reactor water level set point (9 inches) initiating Group 2 and 3 containment isolations. The Group 2 containment isolation closed containment sample valves and containment sump isolation valves. The Group 3 containment isolation closed the reactor water cleanup isolation valves and recirculation system sample valves. This is a normal plant response to

a reactor scram.

The reactor feedwater pumps promptly restored reactor water level.

Operators closed the feedwater regulating valves in response to the rising reactor water level. Level subsequently rose to the reactor feedwater pump trip set point (48 inches), due primarily to expansion of reactor coolant.

Both reactor feedwater pumps tripped. The Group 3 containment isolation was reset and the Reactor Water Cleanup system was placed in service to provide a means to reduce reactor water level.

Main steam line pressure decreased below the low pressure set point (840 psig) initiating a Group 1 containment isolation. The Group 1 containment isolation closed main steam isolation valves.

Normally this isolation is bypassed following a reactor scram by taking the reactor mode switch out of RUN.

With the main steam isolation valves closed, reactor pressure increased to the set point for the safety relief valve Low Low Set system (1 052 psig).

Low Low Set logic opened "H" safety relief valve twice. Control room operators subsequently opened "G" safety relief valve to decrease reactor pressure manually. Following the closing of "G" safety relief valve, reactor water level decreased below the low level set point initiating a Group 3 containment isolation. A reactor feedwater pump was started, and water level was restored.

The Group 1 containment isolation was reset, the main steam isolation valves were reopened to restore the condenser as a heat sink, and the plant

was placed in cold shutdown.

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1\_/EIIS Component Code: ISV, EIIS System Code: SH

2\_/EIIS Component Code: RCB

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## Event Analysis

### Analysis of Reportability

This report is being submitted per 10 CFR 50.73(a)(2)(iv) because the event involved actuations of engineered safety features.

### Identified Issues

Analysis of the event identified the following issues:

- 1) A pressure transient in the Off-gas system caused the air ejector suction isolation valves to close and the "B" Off-gas Recombiner to trip. A manual scram was required because of the loss of off-gas removal capability.
- 2) The reactor mode switch was not taken out of RUN prior to main steam line pressure decreasing below the low pressure set point of the Group 1 containment isolation.
- 3) Operators experienced difficulty reducing differential pressure across the main steam isolation valves so that they could be reopened.

Procedures directed the operators to isolate steam loads and re-pressurize the lines by opening the main steam line drains. The operators did not initially isolate two of the steam loads identified

by the procedure. The "G" safety relief valve was opened in the belief that this would decrease the differential pressure across the main steam isolation valves and in order to prevent further cycling of the safety relief valves. This action did not decrease the differential pressure as the steam loads had not yet been isolated.

The operators subsequently identified the missed steps, isolated the steam loads and successfully reduced the differential pressure.

4) Sections of piping of the Reactor Water Cleanup and connected systems (i.e., Reactor Core Isolation Cooling and High Pressure Coolant Injection) exceeded the design temperature by approximately 50 degrees

F. The reactor vessel feedwater nozzles experienced a thermal cycle that was not bounded by the fatigue analysis.

#### Safety Significance

The Off-gas system is designed to withstand a rapid recombination of hydrogen and oxygen. The system was walked down and no problems were identified.

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The event resulted in challenges to several safety systems (i.e., manual reactor scram, safety relief valves, containment isolations and suppression pool cooling). All performed as designed.

Stresses associated with piping that exceeded design temperatures were found to be within operability limits. The feedwater nozzle thermal transient was analyzed and the cumulative fatigue usage was found to remain

well within allowables.

For the above reasons, the health and safety of the public were not affected by this event.

#### Causes

The causes of the identified issues are discussed below in the same order as presented in the "Identified Issues" section:

- 1) Rapid recombination of hydrogen and oxygen caused the high pressure trip of the air ejector suction isolation valves and the off-gas recombiner. Catalyst fines had migrated out of the recombiner and caused the premature recombination.
- 2) The licensed operator focused on controlling reactor water level to the extent that the reactor mode switch was not taken out of RUN prior to main steam line pressure reaching the low pressure Group 1 containment isolation set point.
- 3) The licensed operator, who did not initially isolate steam loads, did not perform timely selfchecking. Further, support from crew members and supervisory oversight did not effectively identify the error or prevent the circumstances under which "G" safety relief valve was opened. Training and procedure deficiencies contributed to the difficulty experienced with reducing differential pressure across the main steam isolation valves.
- 4) Plant design did not account for the full range of post scram temperatures that could be experienced by the Reactor Water Cleanup

system and reactor vessel feedwater nozzles.

#### Actions

The actions associated with the identified issues are discussed below in the same order as presented in the "Identified Issues" and "Causes" sections:

1) The "B" Off-gas Recombiner suction piping and valves were cleaned to remove catalyst fines. A time delay was added to the high pressure trip of the air ejector suction isolation valves and off-

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gas recombiners. This will allow the Off-gas system to remain in service following short duration pressure transients.

2) Training was provided to all operators on maintaining situational awareness.

3) Training was provided on self-checking, proper safety relief valve operation and management expectations with respect to teamwork and supervisory oversight. Procedures were improved.

4) The Reactor Water Cleanup and attached systems will be evaluated to determine the feasibility of increasing the piping design temperature. Operating procedures will be changed to alert operators to conditions that could exceed piping design temperatures. The feedwater nozzle stress report will be revised to bound larger temperature transients.

#### Failed Component Identification

None

## Similar Events

In 1974, similar events were caused by the migration of off-gas recombiner catalyst into the off-gas piping.

On September 9, 1998 (LER 98004), a similar event occurred. The cause was believed to be a leaking valve and auto-ignition of the hydrogen and oxygen gases. Sampling was done for catalyst but no catalyst was found.

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NSP

Northern States Power Company

Monticello Nuclear Generating Plant

2807 West Hwy 75

Monticello, Minnesota 55362-9637

June 7, 1999

10 CFR Part 50

Section 50.73

US Nuclear Regulatory Commission

Attn: Document Control Desk

Washington, DC 20555

MONTICELLO NUCLEAR GENERATING PLANT

Docket No. 50-263 License No. DPR-22

LER 99-005

Manual Scram Inserted When Pressure Transient



Closes Air Ejector Suction Isolation Valves and Trips Off-gas System

The Licensee Event Report for this occurrence is attached. This report contains no new NRC commitments.

Please contact Tom Parker at (612) 295-1014 if you require further information.

Byron Day

Plant Manager

Monticello Nuclear Generating Plant

c: Regional Administrator - III NRC

NRR Project Manager, NRC

Attachment

Sr Resident Inspector, NRC

State of Minnesota, Attn: Steve Minn

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